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Comprehensive Scientific Assessment of Water Quality Indicators in Wardhannapet Lake, Warangal District

Dr. Sandhya kancharla

Assistant Professor of Zoology, Govt. Degree College, wardhannapet, Warangal

***Abstract*-- This study presents a comprehensive assessment of water quality indicators in Wardhannapet Lake, Warangal District. It was observed that water quality parameters were slightly higher during the wet season compared to the dry season. The lake was not deemed highly polluted and supported rich biodiversity. However, significant increases in heavy metals (Lead, Chromium, Copper, Zinc, Cadmium, and Iron) were noted during the post-monsoon period, mainly due to anthropogenic activities such as idol immersions. The heavy metal concentrations followed a seasonal trend, peaking in winter and declining in summer due to evaporation. These findings underscore the need for preventive measures to protect the lake's ecosystem and ensure sustainable water management and fish production.**

I. INTRODUCTION

In sovereign India, the state of Telangana, Warangal district is geographically, centrally located in the northern Telangana region. This district has large number of freshwater bodies such as canals, reservoirs, lakes, tanks and ponds. Which have rich flora and fauna, however the recent reports revealed that some species found in this region have gradually started disappearing. It may be due to the destruction of natural aquatic environment due to human activities. There is a talk on pollution everywhere as clear natural fresh bodies are being converted into polluted water. Due to rapid growth in industrialization, deposition of chemical, industrial effluents, domestic wastes and agricultural pesticides, sources of heavy metals chemical transformations occur in water leading to decrease in the quality of water affecting the human health. During Idol immersion, the chemical paints used to decorate the idols increases heavy metal concentration and acidity of the water. Without the knowledge of water quality, it is difficult to understand the biological phenomena at length. Because the physico chemical nature of water reveals much about the nature of the ecosystem and it reveals the general biological inter-relationship. Therefore there is a need for proper assessment, monitoring and precautionary measures to overcome the pollutant load in Fresh water body. One of the most important tools for mitigating human impact to streams, rivers and lakes is water monitoring.

Monitoring solutions help to prevent the introduction of contaminants, identifies impaired reaches and helps enforce 8 environmental policies. The quality of water depends on the management of anthropogenic discharges as well as the normal physicochemical characteristics of the catchment areas. Monitoring regimes, along with progressive environmental policies, are helping to mitigate the human impact to natural waters and natural ecosystems to improve the quality of life.

II. AIM

Now a day's water pollution playing a vital role in affecting aquatic environment. Hence, the present study is taken up to analyze the water quality of Wardhannapet lake, whether it is polluted or not with the following objectives.

III. OBJECTIVES

- The main objective of the present study is to analyse the physico-chemical and biological parameters of Wardhannapet Lake.
- To get the comprehensive data the study was conducted for one year and that too Season wise i.e. Pre-monsoon, Mon-soon and Post-monsoon Periods.
- To analyse the distribution of Zooplankton
- To analyse the Heavy metal Concentration after Idol immersion
- To identify fish fauna in the Lake

IV. METHODOLOGY FOR WATER ANALYSIS:

Temperature:

Temperature is one of the most important physical parameters, which is basically important for its effect on the chemical and biological reactions of the organism in the water and plays an important role in determining the potability of water.

Water temperature is measured by using a mercury thermometer. The surface water temperature is best determined by the use of mercury thermometer up to the desired accuracy.

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Water temperature, however, was recorded at depth of about 6cm below the surface level. In most Ecological situations, depending on the study, accuracy may vary from 0.1ºC to 1.0ºC. To maintain the errors, it is essential to calibrate thermometer with another thermometer with known accuracy. While taking the reading, our eyes should be at right angles to the mercury thread. The scale of the thermometer should be immersed in the water up to the level of mercury in the capillary column.

pH:

The pH of natural water lies in the range of 7.0 to 8.5. pH is governed by the Carbondioxide/ Bicarbonate/ Carbonate equilibrium. Changes in equilibrium are brought out by Biochemical reactions induced by micro organisms. Since biological activities are pH specific, determination of pH is very important. The determination of pH is important due to its effect on chemical and biological properties of liquids. It is one of the most important parameter in water chemistry and is defined as $-\log[H^+]$. The pH range is given between 0 to 14; 7 being neutral, less than 7 being acidic and above 7 being basic/alkaline. On field, pH was recorded with the help of standard pH paper strips. The paper is dipped in sample water and colour developed is compared with standard colour code given. In the laboratory pH was recorded with the help of pH meter.

Electrical Conductivity:

Electrical conductance is the ability of a substance to conduct the electrical current. Conductivity is totally dependent on concentration of ions. In water, it is the property caused by the presence of various ionic species. The conductivity from four sampling stations was measured by using digital portable kit, (EPIPRODUCT, MODEL-161-E). The cell constant of conductivity cell was adjusted by moving cell constant switch. The cell was cleaned with distilled water, dried and connected to the conductivity socket of the kit. The function switch was turned on conductivity position and the reading was noted by adjusting range switch to appropriate position. As the ionization of solutes is totally dependent on temperature, therefore the conductivity meter determined all the results measured at 25˚C. The values of conductivity were expressed in µmhos/cm.

Transparency:

It is the measure of light penetration in water and this is inversely proportional to the quantity of dispersed suspended particles in water i.e., turbidity.

Ideal range of transparency is 20-40cm. When transparency is more than 60cm and turbidity is less than 30ppm, poor growth of plankton may occur and productivity will also be low. The observation should not be made early in the morning or late in the afternoon and record the observation through a shaded area of water surface.

It can be measured well with Secchi disk, which is a metallic plate of 20cm diameter with 4 alternate black and white quadrants on the upper surface and a hook at the centre to tie a graduated rope.

- Let down the disk from the water surface and determine the point of its disappearance as the disk is lowered (d_1).
- Allow it to drop a little further and then determine the point of reappearance as the disk is raised (d_2).
- The mean of these two readings $[(d_1+ d_2)/2]$ is taken as the secchi disk transparency.
- Alternatively fix a bright new pin at 'Q' (Zero) point on a meter scale.
- Slowly dip it in water till the pin just disappears from the sight and record the reading of scale at water surface.

Transparency = $(d_1+ d_2)/2$

Where,

d_1 = Depth at which Secchi disk disappear

d_2 = Depth at which Secchi disk reappear

Total Dissolved Solids:

Dissolved solids are solids that are in dissolved state in the solution. Water with high dissolved solids generally are of inferior potability and may induce unfavorable physiological reactions in the transient consumer.

Total Dissolved Solids in any samples can be represented by dissolved and particulate organic and inorganic matter and may be estimated by evaporating the filtered samples through standard filter.

Principle: Total Dissolved Solids are determined as the residue left after evaporation at 100^0C and subsequent drying of the filtered sample.

Procedure: Water sample was filtered through Whatman Filter Paper No. 42. From filterate 100ml of sample evaporated at 100^0C on water bath, followed by drying in oven at 105^0C for 1 hr and weighed.

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Calculation:

Total Dissolved Solids (mg/L) = $[(W_2 - W_1) \times 1000]$/ volume of sample

Where,

W_1 = Initial weight of the dish

W_2 = Final weight of dish.

V. CHEMICAL PARAMETERS:

Dissolved Oxygen: Dissolved Oxygen level in water depends on the physical, chemical and biological activities in water bodies. The determination of Dissolved Oxygen is a key test in water pollution control as well as waste water control.

Principle:

DO of water by Winkler's Iodometric Method. The test for DO is based upon addition of Manganese sulphate immediately followed by strong alkali to the water sample. A white precipitate which in the presence of Oxygen gets manganous oxide to convert the iodide to Iodine. This Iodine will be equivalent to the original DO content.

Procedure:

DO was determined by adopting modified Winkler's method. The surface water samples were collected in narrow mouth glass stoppered BOD bottles of 300ml capacity with proper care to avoid entry of atmospheric oxygen.

To this sample add 2ml of Manganese sulphate (Winkler A) solution, followed by 2ml of Alkali iodide (winklers' B) solution. Sample was mixed by inverting bottle and when precipitate settled, 2ml of concentrated H_2SO_4 was added along the neck of the bottle. The bottle was stoppered and mixed by gentle in version until complete dissolution of precipitate. The sample was fixed as above in the field and was brought to the laboratory.

200ml of sample was taken and titrated with 0.025 N solution thiosulphate solution using starch as an indicator and DO was calculated as..

Calculations:

DO (mg/L) = ml of titrant × 1000 ×8×N / volume of the sample

Where,

N = 0.025 Sodium thiosulphate

Carbondioxide:

CO_2 is a normal component of natural water. In polluted water, it is formed by the biological oxidation of organic matter.

Principle: Sodium Hydroxide reacts with carbonicacid in water to form sodium bicarbonate and water.

$$CO_2 + H_2O \text{---- } HCO_3^- + H^+$$

$$NaOH + HCO_3^- + H^+ \text{ ---- } NaHCO_3 + H_2O$$

Procedure:

100ml of water sample was taken in a conical flask. 5 to 6 drops of phenolphthale in indicator was added and titrated with sodium hydroxide till pink colour appears. Appearance of pink colour indicates of CO_2 in the water sample.

Calculations

Free CO2 (mg/L) = (NaOH required× N of NaOH × 44000) /volume of the sample.

Biological Oxygen Demand (BOD):

It is the oxygen quantity demanded by the micro-organisms (bacteria) to stabilize the organic matter. Since BOD is indirectly proportional to organic matter concentration, value of BOD is taken as the strength of pollution. In the environmental engineering, this parameter is very important for designing the biological treatment plant and assessing the efficiency of it.

Principle:

The Iodometric method, also called as Winkler's method and its modification is the standard volumetric procedures for determining dissolved oxygen. When manganese sulphate solution is added to sample followed by strong alkali, DO rapidly oxidizes an equivalent amount of the dispersed divalent manganese ions, which precipitate to hydroxides of higher valence state. In the presence of iodine ion in an acidic solution the oxidized manganese reverts back to divalent state with the liberation of iodine equivalent to the original DO content. The Iodine is then titrated with thiosulphate to determine DO.

The method consists of filling a specially manufactured airtight BOD bottle with sample or its suitable dilution to overflowing and incubating it at specified temperature conventionally at 20^0C for 5 days or at 27^0C for 3 days. Dissolved oxygen is measured initially on '0' day and finally after incubation of 5 days (or 3 days) and the BOD is computed from the difference between initial and final DO.

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Procedure:

Dilution water was prepared in a glass container by bubbling air in distilled water for about 30 minutes. 1ml each of phosphate buffer, $MgSO_4$, $CaCl_2$ and $FeCl_3$ solution was added for each litre of dilution water maintained at pH around 7 by using NaOH or H_2SO_4. Two sets of BOD bottles were prepared, one set kept in BOD incubator at 20^0C and in other set DO measured immediately. After 5 days incubation DO of the sample was determined.

Calculation

BOD (mg/L) = (D1-D2) × dilution factor

Where,

D1 - initial DO in the sample

D2 - DO after 5 days of incubation

Chlorides:

Chlorides in the form of chloride (cl^-) ion, is one of the major inorganic anions in natural waters. The salty taste to these waters produced by chloride concentrations is variable and depends in the chemical composition of water.

Reagents:

a) Silver nitrate(0.02N) : 3,400 g Silver nitrate in 1 L D.W

b) Potassium Chromate (5%): 5 g Potassium Chromate in 100ml distilled water.

100ml water sample was added with 2ml of potassium chromate and titrated against 0.02 N Silver nitrate, till the reddish brown solution is obtained.

Chloride (mg/L) = [ml × N (of $AgNO_3$) × 1000 ×35.5]/ sample in ml.

Phosphates:

Phosphate is a biologically active element. All inorganic phosphates are usually considered as PO_4. Natural source of Phosphorous to water is from leaching of phosphate bearing rocks and from organic matter decomposition. The quality criteria for phosphorous in water are only to check nuisance growth of algae and process of eutrophication.

Principle:

Phosphorous is converted to Ortho Phosphate by heating or by Per-sulphate digestion while inorganic phosphate are converted thus released can be measured by spectophotometrical method.

Procedure:

25ml of sample was taken in Erlenmeyer flask, then with thorough mixing, 4 ml of Ammonium Molybdate reagent and 0.5ml Stannous Choride solution was added, a blue colour was developed. After 10 minutes absorbance was measured at 690nm of spectrophotometer (Equiptronics – E-9. 820) same procedure for the sample was repeated. Concentration of phosphate in the sample was determined from a standard phosphate calibration curve.

Calculations:

PO4 mg/L = Concentration of phosphate × 1000 / volume of the sample. Sulphates:

Sulphates commonly found in all kinds of water bodies and it is an important anion imparting hardness to the water.

a. *Conditioning reagent:* Mix 75g of NaCl 30ml Conc. HCl, 100 ml 95% ethyl alcohol or isopropyl alcohol in 300ml D.W.Add 50ml glycerol to this solution and mix thoroughly

b. Barium Chloride

c. *Standard Sulphate Solution:* 100 g of Na_2SO_4 in 100 ml D.W (1mg=1ml). This was diluted to obtain different concentrations for standard curve preparation.

100ml of water sample or 1:5 soil suspension was added with 5ml of conditioning reagent and after 5 min added a spoonful of barium chloride powder and stirred for 10 min. This solution was measured for the sulphates turbidity by using Nephelo Turbidity Meter and recorded the values as 'NTU' (Nephelo Turbidity Units). The exact amount of sulphate was measured from standard curve of standard sulphate solution.

Nitrates:

Nitrate is the most highly oxidized state of the element found in the water. It commonly occurs in most natural waters. It is brought in the aquatic body by the bacterial oxidation of atmospheric nitrogen and by a composition of organic matter in watershed. Nitrates are produced by aerobic stabilization of organic nitrogen. It occurs in surface water by leaching from cesspools. Wastes from chemical fertilizer and manufacturing plants contribute nitrates in water.

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Principle:

Nitrate reacts with phenol disulphonic acid and produces a nitro derivative, which in alkaline solution develops yellow colour due to rearrangement of its structure. The colour produced is proportional to the concentration of NO_3 present in the sample.

Procedure:

Neutralize the calorified sample to pH 7. Take a sample in beaker and evaporate to dryness on water bath. Add 2ml of phenol disulphoric acid reagent and transfer to Nesser tube, add 8-10ml (12N) KOH. If turbidity develop add the EDTA reagent drop wise till it disappears, filter and make up to 100ml. Prepare blank in the same way using distilled water and read the colour developed at 410 nm with the light path of 1cm on spectrophotometer (Equiptronics-E-9.820). Prepare calibration curve using suitable aliquots of standard Nitrate solution in the range of 50 to 500mg NO_3.

Calculations:

Nitrate N mg/L =Concentration of Nitrate N×1000/volume of the sample

NO_3 mg/L = Nitrate N mg/L×4.43

Biological parameters:

Plankton analysis:

Plankton are the microscopic plants (Phytoplankton) and animals (zooplankton) in and around the euphotic zone in an aquatic ecosystem.

Biological methods used for the plankton analysis are sample collection, preservation, counting and identification of the aquatic organisms and processing and interpretation of biological data.

Collection of Plankton:

During the period of investigation monthly samples were collected by a plankton net made of silk bolting cloth silk no. 25 (Mesh size 56 µm). Water sample (50 liter) was filtered through the net from littoral and open water zones and carefully transferred to 50 ml bottle and preserved in 4% formalin. Preserved samples were examined under a binocular microscope with different magnification. Quantitative analysis was done on a Sedgwick Rafter Counter cell by taking 1 ml sample. Taxonomic identification was carried out with the help of standard literature by Pennak(1989), Michael(1986), Kodarkar (1992) and Dhanapathi(2000).

Statistical Analysis:

Standard statistical analytical methods were applied to calculate the Mean and Standard Deviation of the physico-chemical and the biological parameters as referred by Bliss(1970) and champbell(1978).

Collection & Identification of Fish Fauna

The identification of the species was done mainly on the basis of the colour pattern, specific spots or marks on the surface of the body, shape of the body, structure of various fins and fin formula etc. photographs of all the fishes were taken.

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Table. 1:
Seasonal Variation and Mean & Standard Deviation of Physico – Chemical Parameters of Wardhannapet Lake during 2022 -2023

S.NO	PARAMETERS	RANGE	PRE MONSOON	MONSOON	POST MONSOON	FEPA	WHO
1	Water Temperature (C)	21.22 - 30.35	27.58 ±2.42	27.28 ±0.87	23.61 ±2.29	<27˚C	<35˚C
2	pH	7.1 - 7.6	7.45 ±0.12	7.36 ±0.17	7.30 ± 0.07	6-9	6.5-8.5
3.	Electrical conductivity	0.22-0.53	0.30 ±0.02	0.34± 0.01	0.27±0.03	20.00-1000	40.00-1500
4.	Transparancy(mg/l)	30.62-86.87	84.00 ±2.06	33.25±3.89	57.50±4.30	25-45	20-100
5.	Dissolved Oxygen(mg/l)	6.1 - 8.9	6.51± 0.79	8.45 ± 0.35	6.79 ± 0.23	8-10mg/l	8-10mg/l
6.	Biological Oxygen Demand(mg/l)	3.82-15.15	4.72±0.30	8.60±0.27	03.70±0.25	10-20mg/l	5-20 mg/l
7.	Total Hardness(mg/l)	93 - 212.75	134 ± 26.68	132 ±9.98	147.31 ±12.30	180 mg/ l	200mg/l
8.	Total Dissolved solids(mg/l)	162.50-424.50	258.25 ±4.91	410.50 ±6.68	184.10±4.12	<1,500mg/l	<1000mg/l
9.	Free Carbon dioxide (mg/l)	2.88-5.18	3.84±0.70	4.87±0.38	2.80±0.57	0.10-25 mg/l	0.05-20 mg/l
10.	Ammonia(ppm)	0.85-1.36	0.80±0.04	1.32±0.03	1.09±0.06	<0.01	<0.05
11.	Chlorides(mg/l)	32.82 - 77.05	67.52 ± 2.65	36.44 ±5.61	70.65 ± 8.85	150 mg/l	250mg/l
12.	Phosphates(mg/l)	0.61-2.23	1.29±0.10	2.11±0.05	0.86±0.05	0.01-3.0 mg/l	0.005-0.05mg/l
13.	Nitrates(mg/l)	0.39-0.85	0.49±0.05	0.83±0.03	0.62±0.03	>1 mg/l	>0.05mg/l

***FEPA**-Fedaral Environmental Protection Agency*

***WHO**-World Health Organisation*

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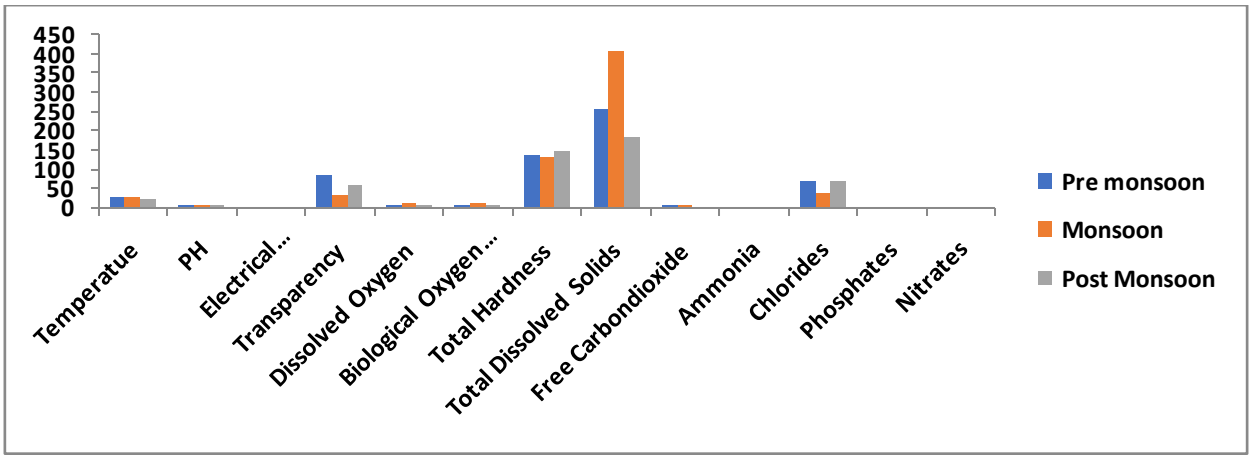
Seasonal Variation and Mean & Standard Deviation of Physico –
Chemical parameters of Wardhannapet Lake during 2022 -2023



Zooplankton

Zooplankton In an aquatic ecosystem zooplankton plays an important role not only in converting plant food to animal food but also provide an important food source for higher organisms including fish. The study of freshwater fauna especially zooplankton, even of a particular area is extensive and complicated due to environmental, physical, geographical and chemical variation involving ecological, extrinsic and intrinsic factors. This is particularly so with freshwater fauna (Zooplankton) which plays a key role in preservation and maintenance of ecological balance and its basic study is wanting and absolutely necessary. The seasonal fluctuations of the zooplankton population are a well known phenomenon and zooplanktons exhibits bimodal oscillation with a spring and autumn in the temperate lakes and reservoirs Welch, (1952). This fluctuation is greatly influenced by the variation in the temperature along with many other factors. Among the several factors temperature seems to exhibit the greatest influence on the periodicity of zooplanktons (Byars, 1960 and Battish and Kumari, 1996). However, in shallow tropical perennial or seasonal ponds such a regular food cycle cannot be seen. Thus, in any aquatic ecosystem zooplankton not only take part in Zooplankton of four groups rotifera, cladocera, copepoda and ostracoda. The most significant feature of zooplankton is its immense diversity over space and time. Zooplankton species composition and their number in three different seasons were presented in Table.2.

During the present investigation, the total zooplankton population was dominated by Rotifers in this lake, followed by Cladocerans, Copepodes and ostracods. The total zooplankton population of this lake has rotifera (38.82%), cladocera (18.37%), copepoda (20%) and ostracoda (22.79%).

1. Rotefera: In the present investigation 12 species belonging to rotifera has been identified in Wardhannapet Lake. Brachionusforficula, Brachionuscalciflorus ,Brachionusfalcatus and Keratella tropica were more dominant among the rotiferans. High population was observed during Post monsoon season followed by Pre monsoon season and lowest population observed during monsoon season. Fluctuations in zooplankton density have been attributed to turbidity. Welch (1952), Roy (1955), Tandon and Singh (1972) have shown a direct relationship between rotifera population and water temperature. Dissolved oxygen has been correlated with abundance of rotifers.

2. Cladocera: In the present investigation the cladoceran populations of Wardhannapet Lake were maximum during in Pre monsoon season followed by post monsoon season and least during monsoon season. The total 7 species of cladocera were identified in the present study. Acropenusharpae, Dapniasarsi, Dapniacarinata and Alona rectangula were more dominant and observed in this year of total study and they are seasonally fluctuated. Micheal (1969) noted the highest peaks of cladocerans during March and April. Seenayya (1973) also observed the maximum peaks of cladoceran during Pre monsoon.

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3. Copepods: In the present investigation the copepods population of Wardhannapet Lake were maximum during Post monsoon season followed by Pre monsoon season and least during monsoon season. The total 6 species of copepods were identified in the present study. Nauplius larva, Copepodanaplii, Cyclops strennus and Mesocyclopshyalinus were more dominant and observed in this year of total study and they are seasonally fluctuated.

4. Ostracoda: In the present investigation the Ostracods population of Wardhannapet Lake was maximum during monsoon season followed by Post monsoon season and lowest during pre monsoon season. The total 4 species of Ostracods were identified in the present study. Hemicyprisfossucula, Heterocyprisspp were more dominant and observed in this year of total study and they are seasonally fluctuated. Chandrasekhar (1996), reported higher population of Ostracods during monsoon in Saroornagar lake of Hyderabad.

In the present investigation, zooplankton was studied under four groups viz. Rotifera, Cladocera, Copepoda and Ostracoda.

Among the four groups, Rotifera, showed its dominance at all the stations. Total zooplankton showed its higher concentration during winter season and low during monsoon season. The maintenance of healthy aquatic environment is dependent onthePhysico-chemical parameters and Biological diversity. Plankton were collected with the help of plankton net filtered and preserved for further analysis. We have taken photographs with the help of Binocular Microscope with a camera attached. These zooplankton species are useful as bioindicators.

The Identified Zooplankton were categorized into 3 classes as follows

Rotifera: Brachionuscaudatus, B.calciforus, B.fulcatus, Keratellatropica, Asplanchabrightwelli.

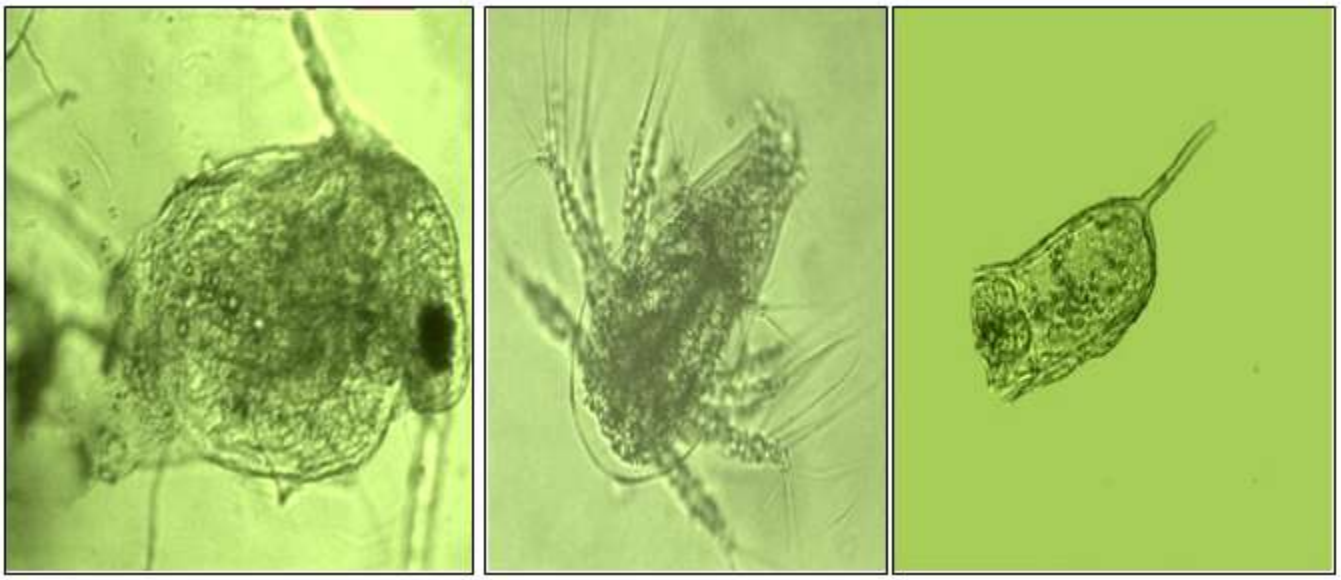
Cladocere: Daphnia carinata, Ceriodaphniacornuata.

Copepoda: Nauplius lava, Cyclops viridis.

Group wise Distribution of Zooplankton population in Wardhannapet Lake

During the year 2022 to 2023

Zooplankton Photographs



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Heavy Metal Concentration

Heavy metal content in the water of Wardhannapet Lake was studied during the year from February 2022 to January 2023 and the results were presented in the Table. Some data was collected from Irrigation department, Parvathagiri Mandal.

Heavy metal concentration in Pre monsoon during the year 2023-2024

Heavy metal	Concentration Values
Pb (Lead)	0.23±0.04 mg/l
Cr (Chromium)	0.03±0.01 mg/l
Cu (Copper)	0.60±0.30 mg/l
Zn (Zinc)	0.26±0.16 mg/l
Cd (Cadmium)	0.03±0.01 mg/l
Fe (Iron)	0.42±0.27 mg/l

Heavy metal concentration in Monsoon during the year 2023-2024

Heavy metal	Concentration Values
Pb (Lead)	0.08 ± 0.03 mg/l
Cr (Chromium)	0.04±0.01 mg/l
Cu (Copper)	1.65±0.26 mg/l
Zn (Zinc)	0.46±0.20 mg/l
Cd (Cadmium)	0.06±0.02 mg/l
Fe (Iron)	0.71±0.36 mg/l

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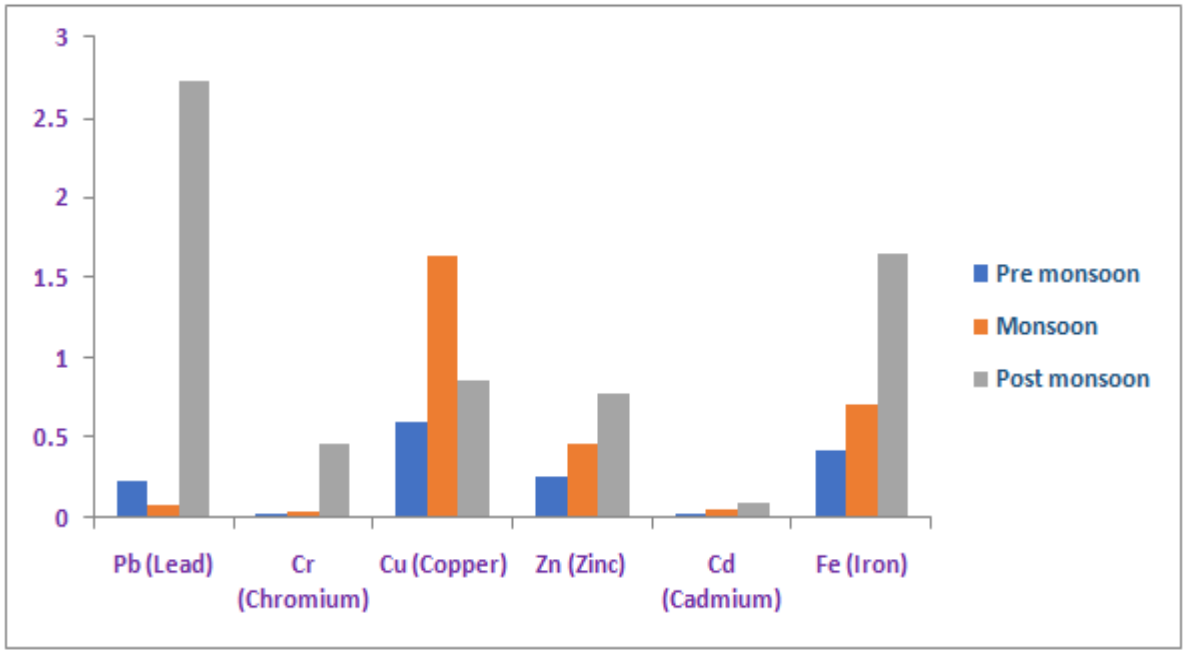
Heavy metal concentration in Post monsoon during the year 2023-2024

Heavy metal	Concentration Values
Pb (Lead)	2.74± l0.08 mg/l
Cr (Chromium)	0.46±0.48 mg/l
Cu (Copper)	0.86±0.08 mg/l
Zn (Zinc)	0.78±0.10 mg/l
Cd (Cadmium)	0.10±0.06 mg/l
Fe (Iron)	1.66±0.16 mg/l

Graph shows Seasonal variation of Heavy metal Concentration



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VI. CONCLUSION

Results of water quality assessment in Wardhannapet lake clearly showed that most of the water quality parameters vary slightly higher in the wet season than in the dry season. This lake was not considered to be more polluted. This lake has shown rich biodiversity of aquatic fauna. Therefore, it is suggested that the immediate measures are necessary to be initiated to avoid further contamination of lake due to anthropological activities. The baseline data generated would help planning and future management decisions to develop fresh water lakes for better water quality and production of fish in the fresh water.

This will ensure that some of the parameters in this study will not exceed level. The lake is having rich diversity of flora and fauna. Heavy metals like Lead, Chromium, Copper, Zinc, Cadmium and Iron were significantly increased during post monsoon due to anthropological activities like Bathukamma & Vinayaka Idol Immersion. It is observed. The impact of the idol immersion and the anthropogenic activities in various ways lead to increase in the concentration of the heavy metals takes place during the immersion period and then after the down fall of the metals is seen. The similar trend is fallowed as the metals increased during the winter and decreased during the summer as the heavy metals are evaporated due to the high atmospheric temperature. Such a measure will guarantee the safety of the aquatic ecosystem, humans and environment for good and healthy production of fish for consumption. At present this fresh water lake is suitable for fish culturing and irrigation purpose. This data certainly highly useful for making further planning on this lake for water utilization and conservation.

SUGGESSIONS:

- Bio-monitoring of lakes and rivers should take place and steps to be taken to make the aquatic ecosystems to improve better manner.
- The baseline data generated would help for planning and future management decisions to develop fresh water lakes for better water quality and production of fish in the fresh water.
- The precautionary measures are to be taken to control and steps to be taken to protect the natural aquatic bodies and biodiversity. At this critical juncture the local representatives, Government and Non- Government bodies, the educated bodies, and the reputed figures of the society should come forward and formulate conservational model for the sustainability of these beautiful water bodies.
- Idol should be made with traditional. Natural materials like quick dissolving clay.
- Use of toxic and non biodegradable chemical dyes for painting idols should be strictly prohibited.
- Worship material like flowers, clothes, decorating material etc. should be removed before immersion of idols. Biodegradable materials should be collected separately for recycling or composting. Nonbiodegradable materials should be collected separately for disposal insanitary landfills
- Public should be educated on ill effects of immersion in the whole water bodies through mass awareness programme.
- Arrangement may be made for construction of temporary confined ponds with earthen bunds for the purpose of immersion of idols.
- Water quality assessment results before and after Idol immersion, Results should be posted on the website such results are Physico-chemical parameters such as pH, DO, BOD, COD, Conductivity, Turbidity, TDS, Total Solids and Metals (Chromium, Lead, Zinc, Cadmium, Iron and Copper).